Working Towards Math Facts Mastery

Anne Durham

Abstract

Fluency in math facts is essential if students are going to be able to work through more complex math processes with ease. Most of my special education students arrived at middle school with limited skills. To help them achieve mastery with their multiplication and division facts, the intervention described in the article was conducted. Most of the students showed significant improvement in their abilities. The data shows the before and after positions of each student and discusses possible reasons why most did not developed these necessary skills while still in elementary school.

Introduction

Special Education students may either be included in the general education curriculum or placed in separate small group special education classes. Even though the inclusionary setting is preferable, there are students who are believed to lack the prerequisite skills necessary to succeed in that environment. The result is that those students still attend some classes in the resource room.

Fourteen members of two sixth grade special education small group pull out math classes participated in an intervention with the goal of achieving mastery of multiplication and corresponding division facts. Each of the students had an Individuals With Disabilities Education Act (IDEA) eligibility category and an Individualized Educational Program (IEP), but other than that, each was unique as far as learning styles, interests, family backgrounds, cognitive abilities, and social/ behavioral challenges are concerned. The IDEA law of 1997 requires "that all students, including those with disabilities have access to the curriculum and that these students must participate in accountability measures, like statewide performance-based or standardized tests"(Jackson & Davis, 2000 p. 33.). The hope was that mastery of math facts would enable all the students to make progress toward grade level standards and make progress toward proficiency on mandated statewide tests.

Rationale/Significance

Many special needs students, by the time they reach middle school, already have a history of math failure. They doubt their ability to succeed, lack motivation, and often display negative attitudes. They see math as something that is neither enjoyable nor relevant to their lives. Therefore, appropriate attitudes and beliefs, along with motivation are important for the special education student to achieve mathematical success (Mercer & Mercer,1998). Often, special needs students have not mastered basic math facts, and if students do not develop the background necessary for future math success they are in danger of becoming remedial students later on (Loveless, 2004). This is the situation with many special education students.

The development of number sense is necessary to learning basic math in the early grades. Number sense is a relatively new term in mathematics education and is defined as a conceptual framework of number information that helps people understand numbers, number relationships, and helps them solve mathematical problems (Way, 2005). A person's ability to use and understand numbers is usually first taught informally by parents, siblings, and other adults. These early teachings are related to the later development of math problem solving skills and appear to have a socioeconomic correlation, with students from more affluent families displaying more highly developed number sense at an earlier age than students from disadvantaged backgrounds. Gersten and Chard (2001) found, that by age seven students with disabilities were able to recall fewer math facts than those without and the gap widened every year to the point of tripling by age twelve.

People acquire knowledge in different ways and less "scholastic" students are often deemed to be failures even if they can display understanding in less commonly accepted ways than standard academic assessments (Gardner, 1991). Special education math instruction must incorporate concrete, semi-concrete, and abstract activities in its efforts to ensure the success of all students (Mercer & Mercer, 1998).

Enjoyment of math and mathematical success has been positively linked. Supportive relationships both at home and at school are also important and can lessen student academic and emotional anxiety. In general, students who view themselves as competent and consider school important perform better than students who do not feel that way (Ahmed, Minnaert, van der Werf, et al, 2008). Regardless of how students achieve skills, basic math mastery serves as an equalizer, is necessary for advancement in math, and is a predictor of future adult earning (Loveless, 2004).

There are specific traits that when fostered, will help lead students with disabilities toward success. The first is that the student possess an awareness of his/her individual strengths and needs and have a willingness to freely discuss them without being defined by them. Students who wish to achieve success must be proactive instead of blaming others for their difficulties. They must persevere, even when it is difficult and understand the difference between failing at something and being a failure. They must receive help to set meaningful and achievable goals. Special needs students must possess and use effective support systems. They must know how to use emotional coping strategies (Raskind, 2009). The resilience of self-discipline, empathy, persistence, autonomy, a healthy outlook, positive expectations, and a sense of humor are the qualities of success for all people, students and adults in life (Gibbs, 2001).

Methods/Procedures/Participants

Fourteen special education students participated in a variety of activities meant to increase fluency in recalling multiplication math facts. Progress was tracked by the scores achieved on individual timed three minute drills during the second and third quarters of the school year. Drills initially consisted of one hundred ordered multiplication facts from one through ten. Once a student reached 80% mastery on the ordered drill, he/she progressed to a mixed version of the same facts. Upon reaching 80% on this version, he/she moved on to one hundred mixed

corresponding division facts. Table A describes each student's initial score and high score of the ordered drill. Only students who were present in class at the beginning of the intervention are included. Students with a ** after their names only participated sporadically and students with a ++ left the class before the project was completed.

Table A

100 Ordered Multiplication Facts

Student	Base Score	High Score	Difference
K	51	90	+39
D	45	84	+39
R**	37	60	+23
B	60	93	+33
Ak	54	92	+38
A	53	80	+27
S	40	82	+42
I	53	88	+35
Ka	32	82	+50
St++	58	82	+24
G**	12	56	+44
Lo++	58	80	+22
Le	40	87	+47
Is**	28	59	+31

Eleven of fourteen students regularly participated in the three minute drills . These students all met the proficiency level of at least 80%. The three students who participated only sporadically did not meet proficiency. The eleven proficient students went on to 100 mixed up multiplication facts with the goal of again achieving a score of at least 80%. The results of the mixed three minute drills are in Table B

Table B

100 Mixed Multiplication Facts

Name	Base Score	High Score	Difference
K	15	49	+34
D	47	55	+8
B	35	81	+46
Ak	32	52	+20
A	20	73	+53
St	60	69	+9
I	49	67	+18
Ka	49	56	+7
S ++	79	90	+11
Lo ++	51	74	+13
Le	13	74	+61

Two of the eleven students achieved 80% mastery on the mixed multiplication drill. Two others, while not achieving mastery, showed a 50+ improvement in their skills.

Two students went on to the division facts. S began with 60% and left the class with a score of 72%. B started with a score of 9% and ended with 12%.

Conclusions/ Reflection

The three minute drill multiplication intervention was successful to the extent that every student who regularly participated was able to reach the target 80% mastery level in the ordered facts.. Even though only two of eleven students mastered the mixed multiplication facts, every student made gains and in some cases, those gains were significant.

There was also score improvement on some of the state restructuring required benchmark tests. However, even though many of the students were able to demonstrate written competence, none could immediately recall verbally presented facts. They all required ”think time”. Progress also might have been more significant if more of the students had reviewed their facts outside of class.

The project is currently being repeated with new students and some changes but it is still too early in the year to know what the final results will be. Timed drills are being supplemented

with other activities, such as bingo, flashcards, and games. It is hoped that regular computer access will soon become available.

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